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46. The catheter of claim 21, wherein said jet emanator is formed at least in part in a shape selected from the group consisting of linear, L-shaped, J-shaped, semi-toroidal, and toroidal.

47. The catheter of claim 46, wherein said at least one jet orifice is located at the extreme end of said jet emanator.

48. The catheter of claim 46, wherein said at least one jet orifice comprises a plurality of jet orifices.

49. The catheter of claim 21, further comprising an isolation balloon attached to said catheter.

50. The catheter of claim 21, further comprising an isolation filter attached to said catheter.

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C1) 51. An elongated device for treatment of thrombus or other unwanted material in a vessel or cavity of a living body comprising:

- a. a proximal end and a distal end;
- b. ⁴⁴ high pressure tubular means for conveying pressurized fluid from said proximal end to said distal end;
- c. pressurized fluid connection means for connecting the proximal end of said high pressure tubular means to a source of pressurized fluid;
- d. jet emanator means with at least one jet orifice for directing at least one high velocity fluid jet in the vicinity of said distal end, said jet emanator means being attached to and in fluid communication with said high pressure tubular means;
- e. second tubular means for conveying fluid, at least one of said jet¹¹² orifices directing at least one high velocity fluid jet in a distal direction into said second tubular means;
- f. inflow means in said second tubular means, located distal to said at least one jet orifice, and oriented so that at least one high velocity fluid jet entrains and draws surrounding blood or other fluid from a body vessel or cavity through said inflow means and into said second tubular means, and creating a region of elevated pressure in said second tubular means;

g. outflow means in said second tubular means located at said region of elevated pressure, said outflow means thereby providing for passage of fluid out from said second tubular means into a body vessel or cavity, creating one or more cross stream jets which provide force (normal and/or drag forces) which help to break thrombus or other unwanted material off the surface of a body vessel or cavity;

h. one or more of said high velocity jet(s) act to break apart thrombus or other unwanted material which has been entrained by said high velocity jet(s); and,

i. said high velocity jet(s), said inflow means, and said outflow means create a recirculation pattern so that fluid flows from said outflow means with radial flow vectors and circumferential and/or axial flow vectors to said inflow means and back into said second tubular means, thereby providing enhanced removal of thrombus or other unwanted material off the surface of a body vessel or cavity, and macerating the thrombus or other unwanted material by action of said high velocity jet(s).

52. The device of claim 51, wherein said inflow means comprises at least a portion of at least one orifice and said outflow means comprises at least a portion of at least one orifice.

53. The device of claim 51, wherein said jet emanator means is formed at least in part in a shape selected from the group consisting of linear, L-shaped, J-shaped, semi-toroidal, and toroidal.

54. The device of claim 51, wherein said at least one jet orifice is located at the extreme end of said jet emanator means.

55. The device of claim 51, wherein said at least one jet orifice comprises a plurality of jet orifices.

56. The device of claim 51, further comprising isolation means for isolating the portion of the body vessel or cavity near said distal end of said elongated device.

57. The device of claim 51, wherein high pressure fluid is provided in the range of approximately 150 to 500 psi.

58. The device of claim 51, wherein high pressure fluid is provided in the range of approximately 500 to 2500 psi.

59. The device of claim 51, wherein high pressure fluid is provided in the range of approximately 2500 to 50000 psi.

60. The device of claim 51, wherein high pressure fluid in said jet emanator means is in the range of approximately 50 to 350 psi.

61. The device of claim 51, wherein high pressure fluid in said jet emanator means is in the range of approximately 350 to 850 psi.

62. The device of claim 51, wherein high pressure fluid in said jet emanator means is in the range of approximately 850 to 35000 psi.

63. The device of claim 51, wherein said high velocity jet(s) have maximum instantaneous centerline velocity of approximately 2,000 to 30,000 cm/s.

64. The device of claim 51, wherein said high velocity jet(s) have maximum instantaneous centerline velocity of approximately 7,000 to 20,000 cm/s.

Abstract

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65. A system for treatment of thrombus or other unwanted material in a vessel or cavity of a living body comprising:

- a. an elongated device having a proximal end and a distal end;
- b. high pressure tubular means forming part of said elongated device for conveying pressurized fluid from said proximal end to said distal end;
- c. pressurized fluid connection means located at said proximal end of said high pressure tubular means;
- d. pressurized fluid source means connected to said pressurized fluid connection means;
- e. jet emanator means with at least one jet orifice for directing at least one high velocity fluid jet in the vicinity of said distal end of said elongated device, said jet emanator means being attached to and in fluid communication with said high pressure tubular means;
- f. second tubular means for conveying fluid, at least one of said jet orifices directing at least one high velocity fluid jet in a distal direction into said second tubular means;
- g. inflow means in said second tubular means, located distal to said at least one jet orifice, and oriented so that at least one high velocity fluid jet entrains and draws surrounding blood or other fluid from a body vessel or cavity through said inflow means and

into said second tubular means, and creating
a region of elevated pressure in said second
tubular means;

- h. outflow means in said second tubular means located at said region of elevated pressure, said outflow means thereby providing for passage of fluid out from said second tubular means into a body vessel or cavity, creating one or more cross stream jets which provide force (normal and/or drag forces) which help to break thrombus or other unwanted material off the surface of a body vessel or cavity;
- i. one or more ^{new matter} of said high velocity jet(s) act to break apart thrombus or other unwanted material which has been entrained by said high velocity jet(s); and,
- j. said high velocity jet(s), said inflow means, and said outflow means create a recirculation pattern so that fluid flows from said outflow means with radial flow vectors and circumferential and/or axial flow vectors to said inflow means and back into said second tubular means, thereby providing enhanced removal of thrombus or other unwanted material off the surface of a body vessel or cavity, and macerating the thrombus or other unwanted material by action of said high velocity jet(s).

new matter
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66. The system of claim 65, further comprising isolation means for isolating the portion of the body vessel or cavity near said distal end of said elongated device.

67. The system of claim 65, further comprising:

a. isolation means attached to said elongated device; and,

b. isolation means separate from said elongated device.

68. The system of claim 65, further comprising separate tubular means for removal of fluid and thrombus or other unwanted material debris from the body vessel or cavity.

69. The system of claim 68, further comprising means to regulate the rate of removal of fluid and thrombus or other unwanted material debris from the body vessel or cavity.

70. The system of claim 65, further comprising means for removal of fluid and thrombus or other unwanted material debris from the body vessel or cavity.